01/15/03 17:04 ATILA PREPROCESSOR V5.21 - Boundary Conditions

?
Quit
Break
Reset
+Zoom
-Zoom
View Direction
Delete
Hidden Symbols

1 uX=0
2 uY=0
3 uZ=0
4 ThetaX=0
5 ThetaY=0
6 ThetaZ=0
7 PhI=0
8 P=0
9 Mixt
A Equality

B Excitation
C Loads
++++ 3 ++++

Fig. A

Admittance Y/Phi

Frequency (Hz)

Fig B

Figure C illustrates a resonator according to Schafft, as modified by Kitami, where the operation is in the thickness mode. Figure D illustrates the simulated admittance between 400-700 kHz for the resonator illustrated in Figure C. As illustrated in Figure D, a high number of spurious modes can be seen around the thickness resonance.
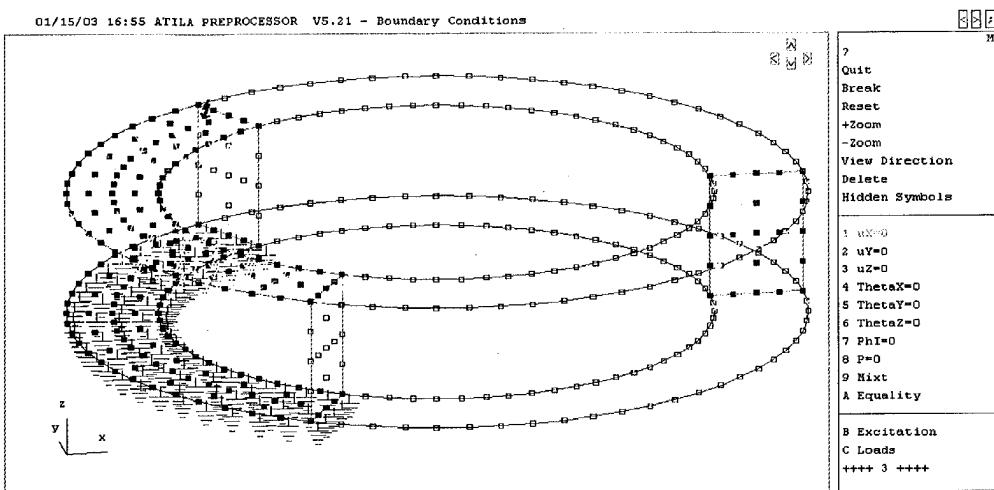
Fig. C
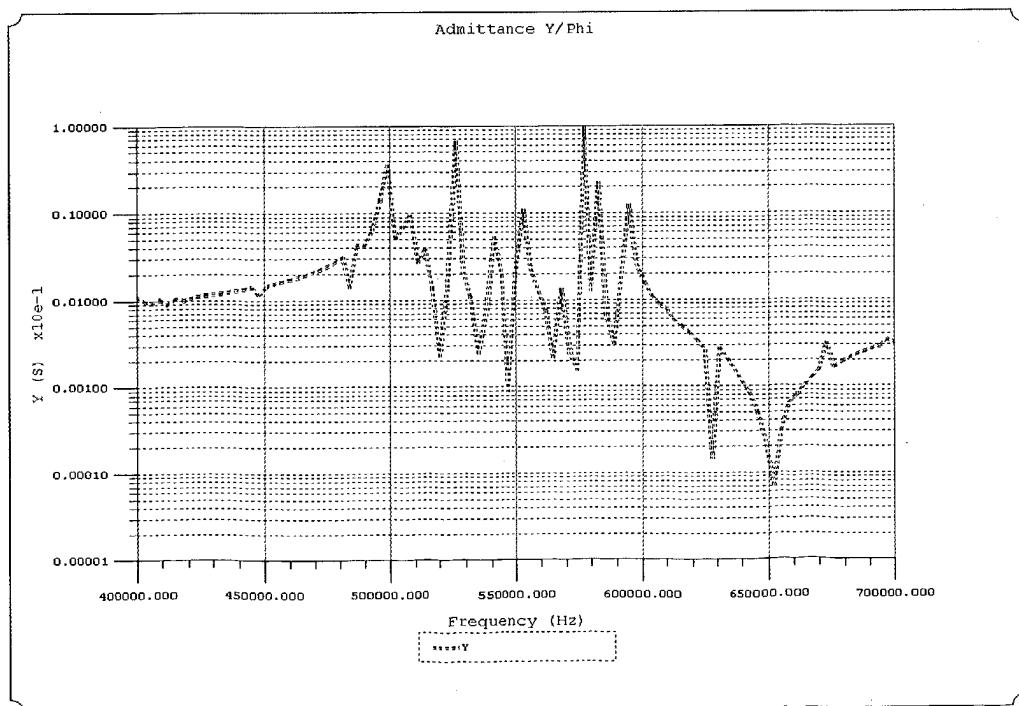
Fig. D
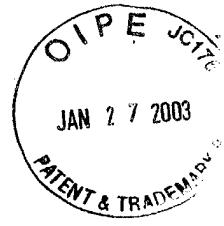
Figure E illustrates a simulation of a transformer in accordance with an exemplary embodiment of the present invention operating in a symmetric mode. Figure F illustrates the simulated admittance between 400-700 kHz for the resonator of Figure E. As clearly illustrated in Figure F, there is one clean resonance pair, free of spurious modes.

For at least the reasons illustrated above in the exemplary simulations, Applicants respectfully submit that the combination of Kitami and Schafft does not operate for its intended purpose and would not obtain the desired results, which is obtained by the present invention, as illustrated in exemplary Figure F.


Fig E

Admittance Y/Phi
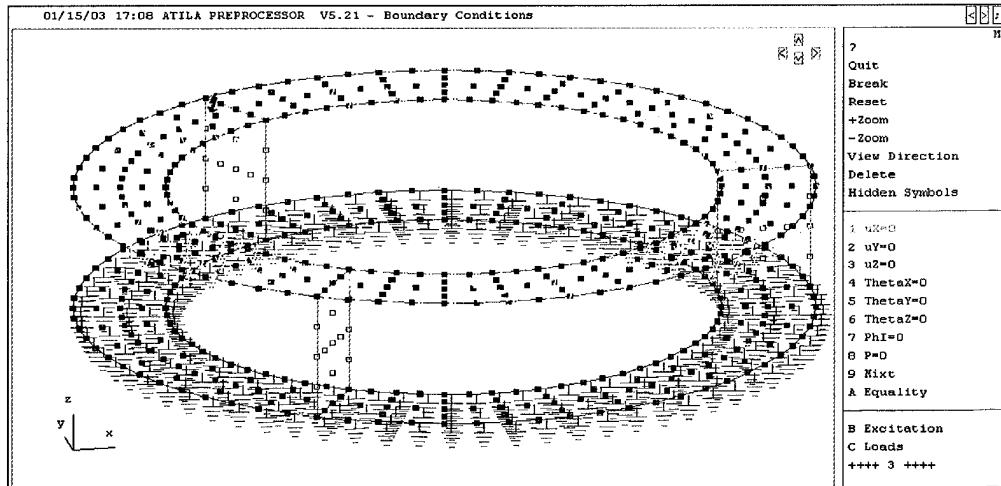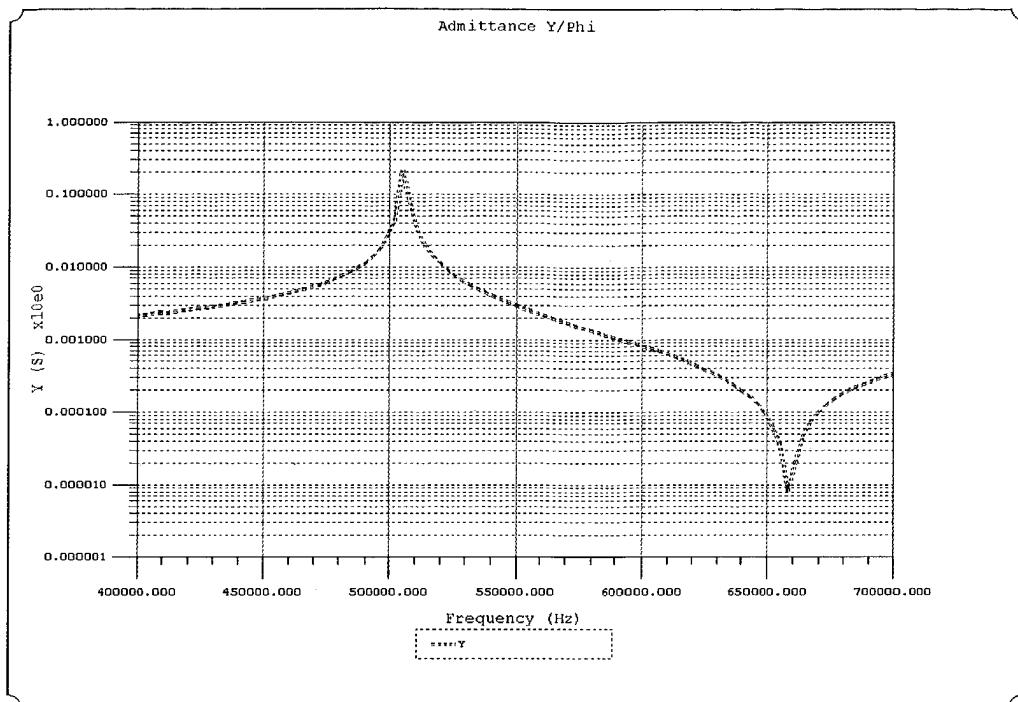
Fig. F

During the personal interview of January 16, 2003, Applicants representative also illustrated exemplary data for specific frequencies. Figures G, H and I, set forth below, each illustrate a PZT ring-shaped transformer designed in accordance with Schafft (where the primary section is in purple), center-filled with PZT. Figures H and I illustrate 433 kHz and 442 kHz, respectively. Figures H and I both illustrate the uneven stress distribution for the transformer modeled in Figure A. The highly uneven stress and amplitude distributions demonstrate the lack of feasibility for this geometry operating at a thickness mode.
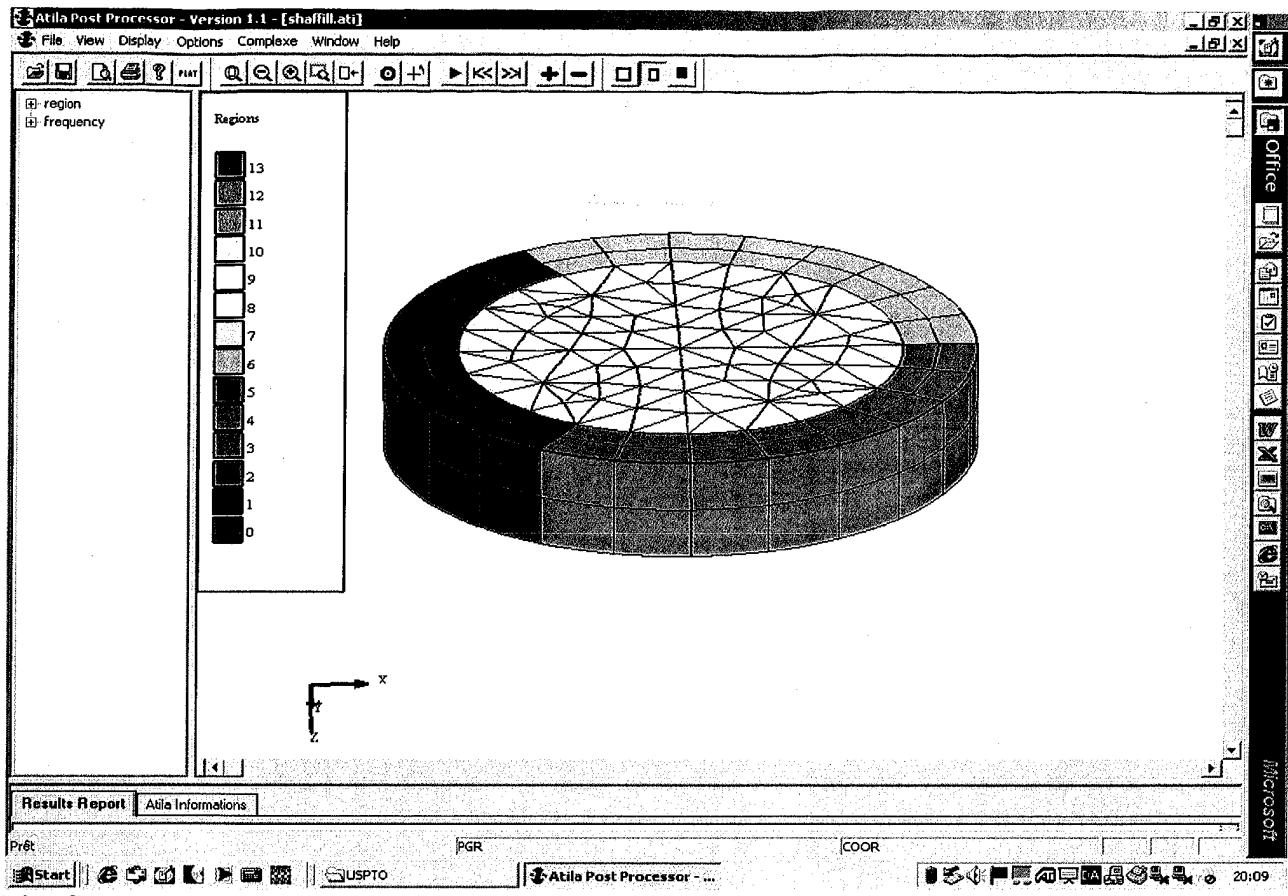
Fig. G
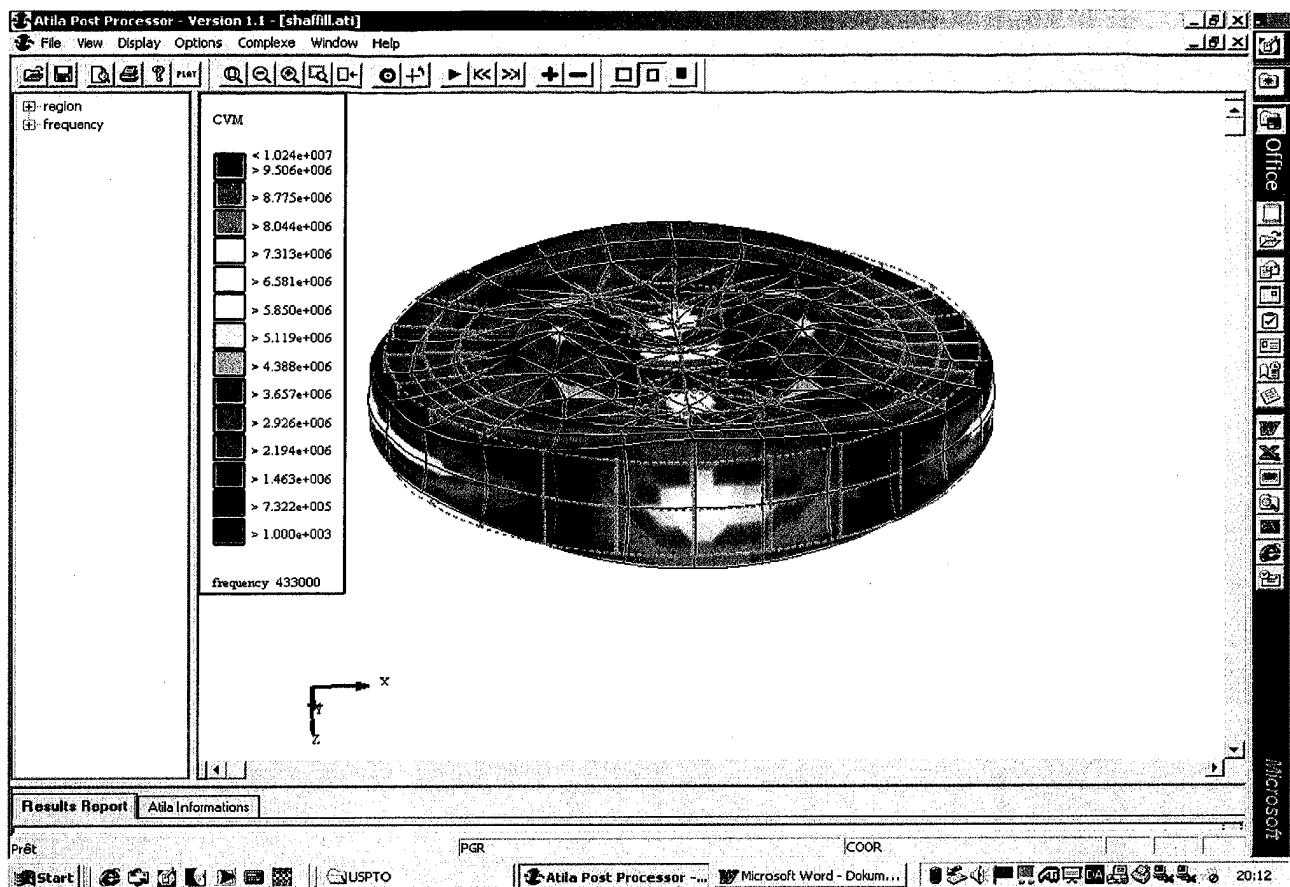
Fig.H
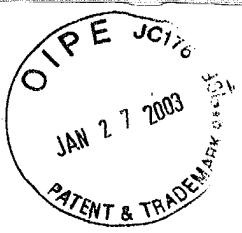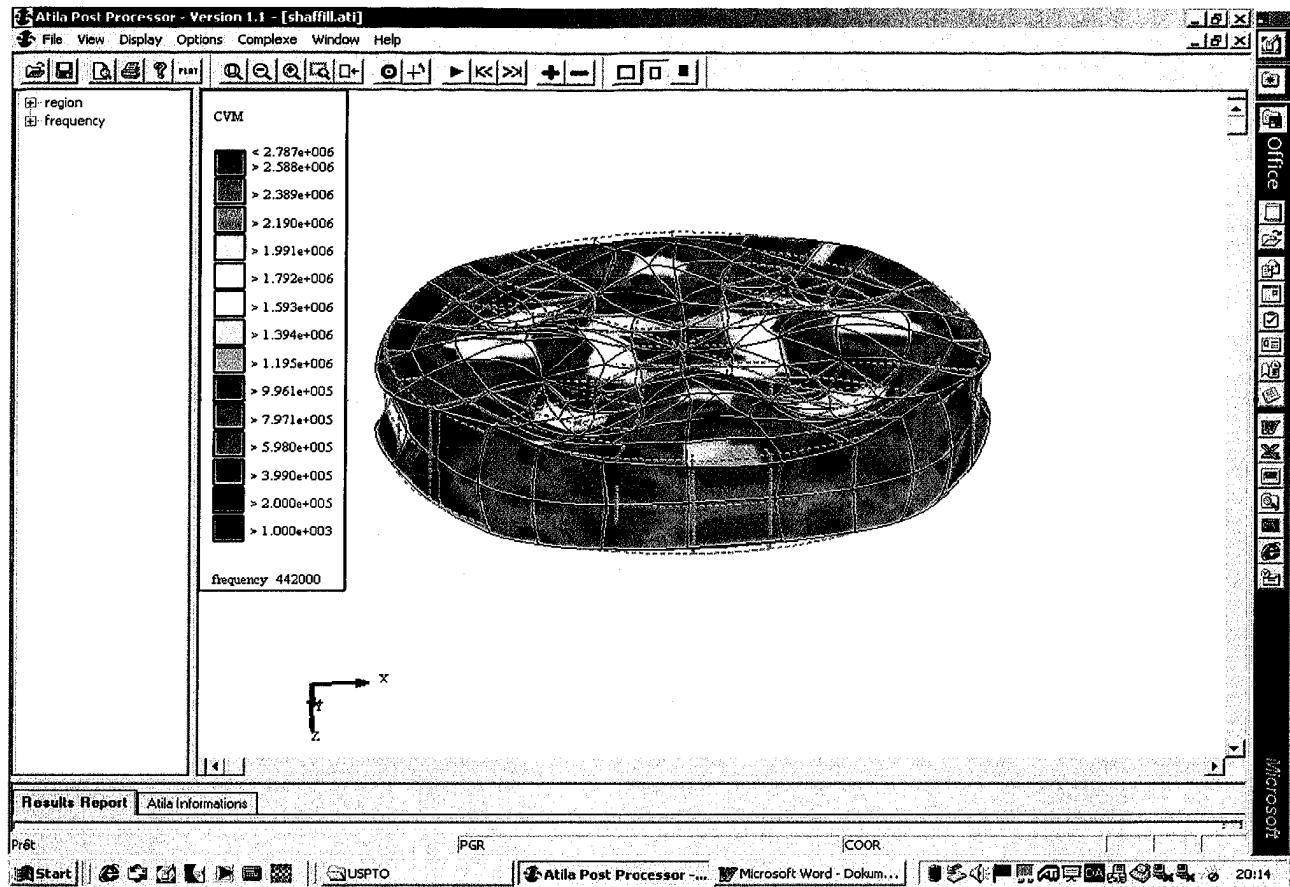
Fig I

Similarly, Figures J and K, set forth below illustrate a PZT ring-shaped transformer designed according to Schafft as modified by Kitami, operating in thickness- instead of hoop-mode. As illustrated in Figures J and K, respectively operating at 409 kHz and 412 kHz, the change in frequency of 2 kHz results in a completely new vibration pattern which indicates that the alleged combination of Kitami and Schafft would contain a highly uneven stress distribution and would be extremely difficult to control.
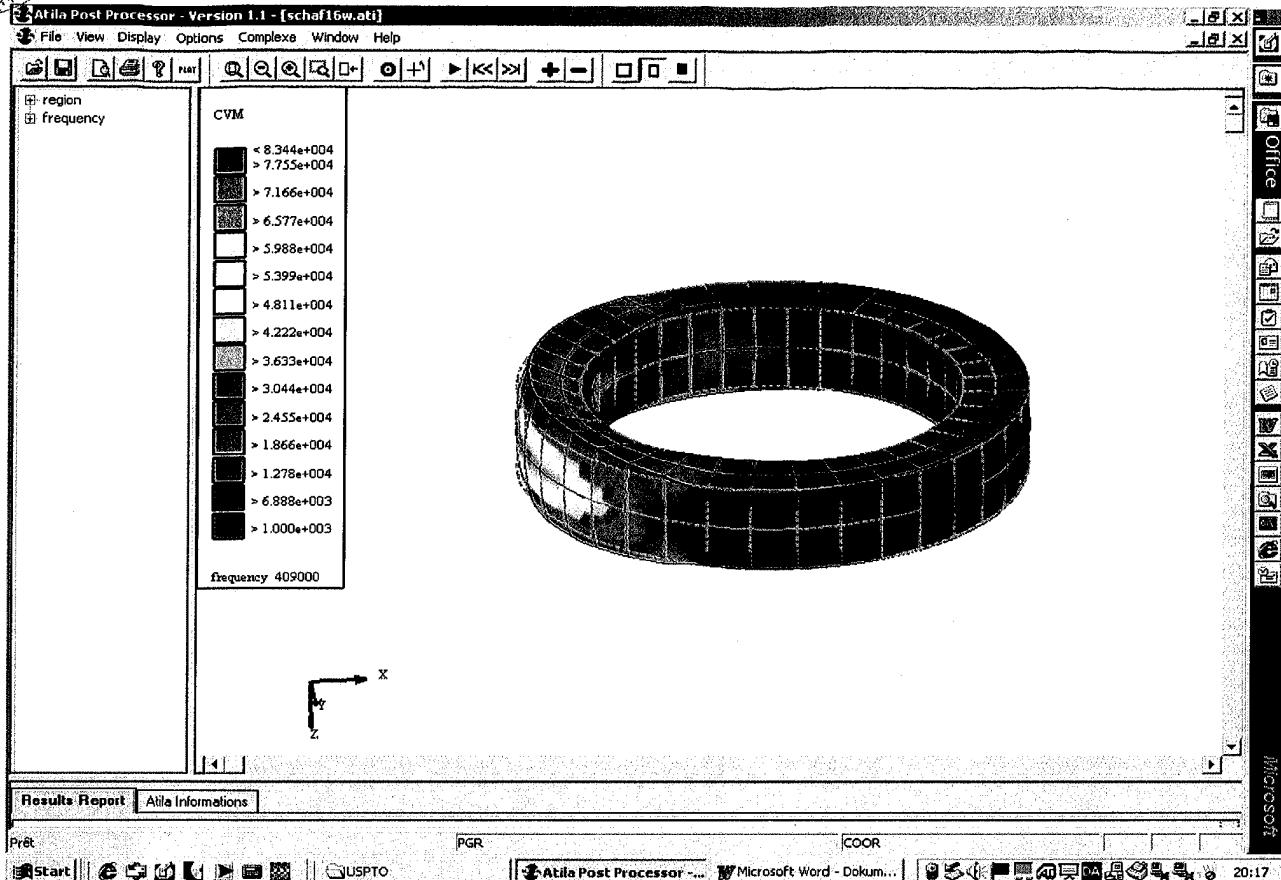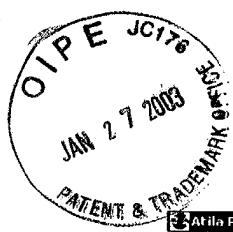
Fig. J
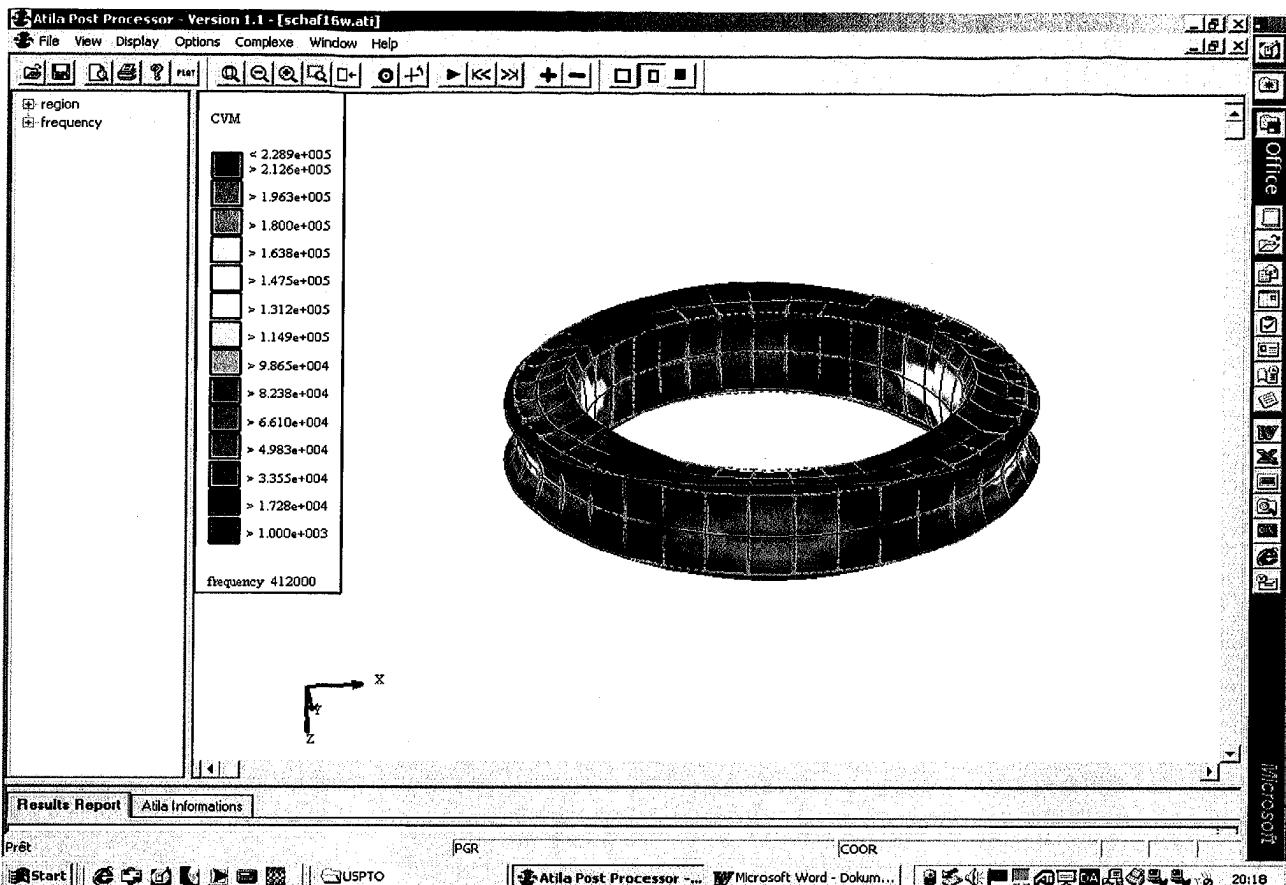
Fig. K

Finally, Figures L, M and N, set forth below, illustrate the ring-shaped transformer in exemplary embodiment of the present invention. As illustrated, even taking widely separated samples, for example at 511 kHz, 583 kHz, and 643 kHz, it is evident that the exemplary embodiment of the present invention provides a broad bandwidth at which the resonator keeps it useful, regular stress distribution.
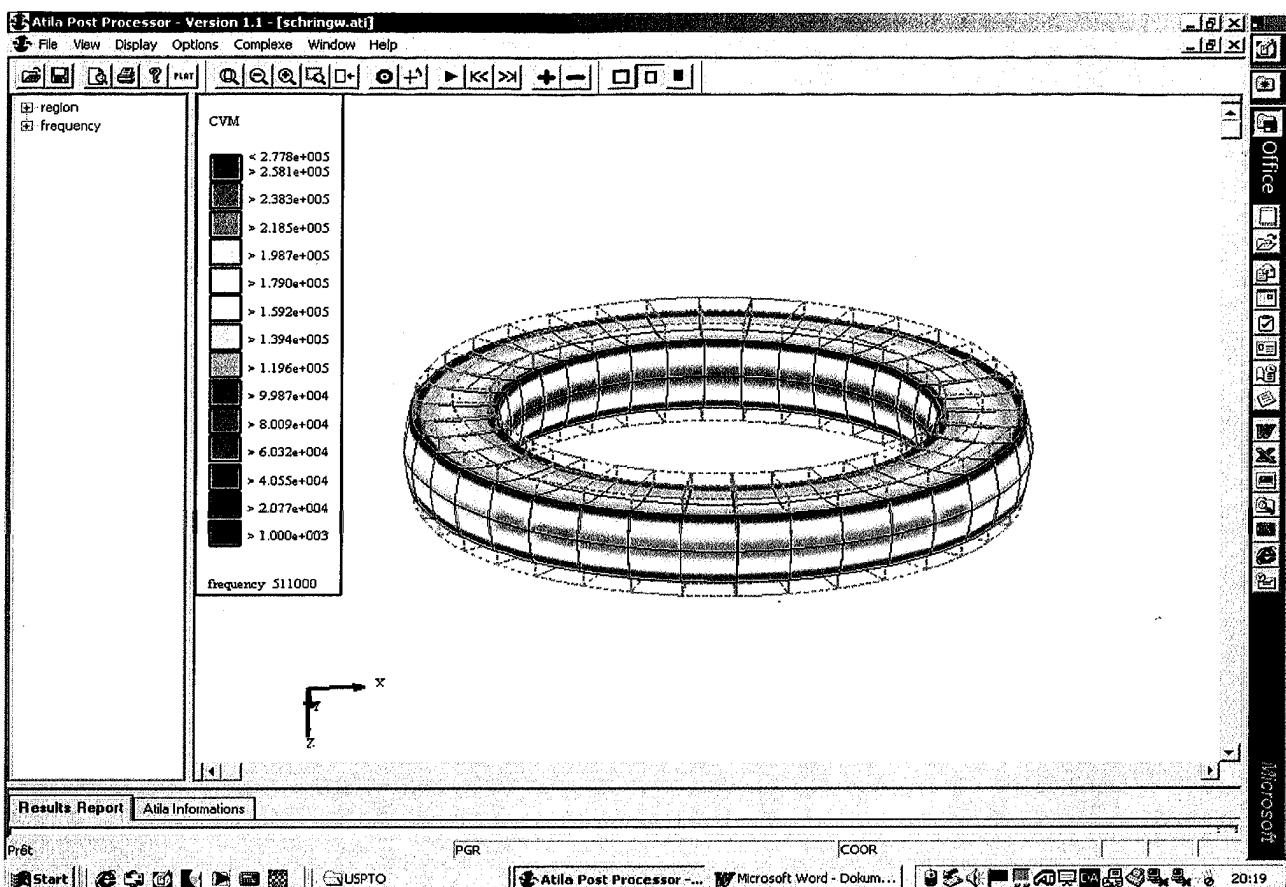
Fig L
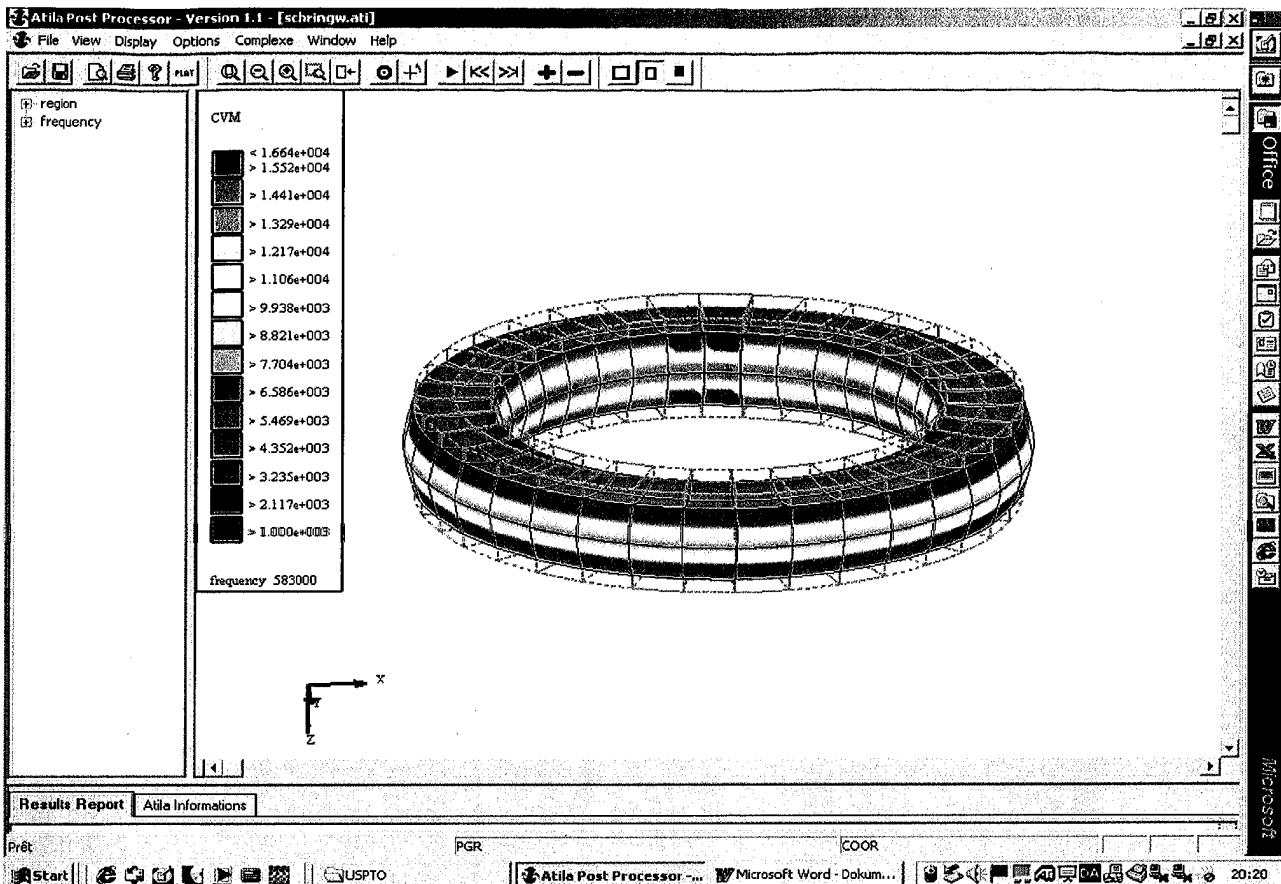
Fig. M
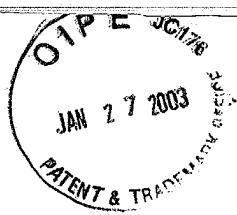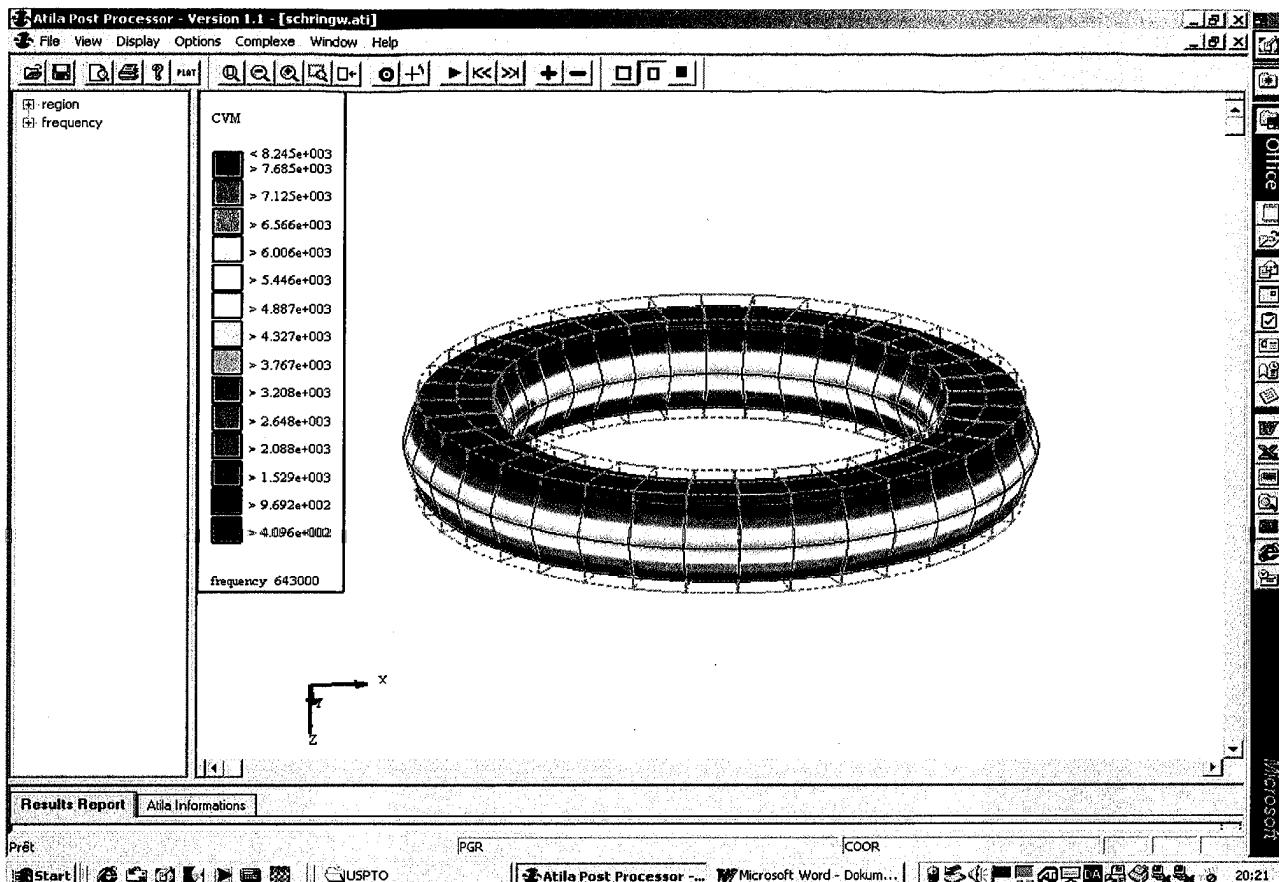
Fig. N

As illustrated in Figures A-N set forth above, the combination of Kitami and Schafft would not operate for its intended purposes. Accordingly, Applicants respectfully submit that one of ordinary skill in the art would not be motivated to combine them. Applicants further respectfully submit that in the absence of a proper prima facie case of obviousness, claims 1-34 of the present application are in condition for allowance

CONCLUSION

In view of the above amendments and remarks, reconsideration of the rejection and allowance of claims 1-34 is respectfully requested.